

**CLAIMS**

1. A medical system comprising:

- a medical instrument to be guided in a patient body,
  - 5 - X-Ray acquisition means for acquiring a two-dimensional X-ray image of said medical instrument,
  - ultrasound acquisition means for acquiring a three-dimensional ultrasound data set of said medical instrument using an ultrasound probe,
  - means for providing a localization of said ultrasound probe within a referential of said X-  
10 ray acquisition means,
  - means for selecting a region of interest around said medical instrument in the three-dimensional ultrasound data set, that define a first localization of said region of interest within a referential of said ultrasound acquisition means,
  - means for converting said first localization of said region of interest within said  
15 referential of the ultrasound acquisition means into a second localization of said region of interest within said referential of the X-ray acquisition means, using said localization of the ultrasound probe,
  - means for generating and displaying a bi-modal representation of said medical instrument in which said two-dimensional X-ray image and the three-dimensional ultrasound data  
20 included in said region of interest are combined using said second localization.
2. A system as claimed in claim 1, wherein said means for selecting a region of interest are intended to define a reference plane in which a part of said medical instrument is included.
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3. A system as claimed in claim 2, wherein said region of interest is a 2D ultrasound image obtained by sampling said 3D ultrasound data set over said reference plane.
4. A system as claimed in claim 2, wherein said region of interest is obtained by  
30 cropping a 3D ultrasound data subset, which lies behind said reference plane or by cropping a slab which is formed around said reference plane.

5. A system as claimed in claim 4, wherein said generating means are intended to generate a volume rendered view of said region of interest within said 3D ultrasound data set.
- 5 6. A system as claimed in claim 1, wherein said probe localization means are intended to localize an active localizer, which has been arranged on said ultrasound probe.
7. A system as claimed in claim 1, wherein said ultrasound probe is equipped with at least three non aligned and interdependent radio-opaque markers and said localization  
10 means are intended to localize said markers in at least a first 2D X-ray image having a first orientation angle in said referential.
8. A system as claimed in claim 7, wherein said localization means are intended to further localize said markers in a second 2D X-ray image having a second orientation  
15 angle in said referential.
9. A system as claimed in claim 1, wherein said selection means comprise means for detecting said medical instrument within said region of interest of the 3D ultrasound data set and said generating means are intended to give to the points of the detected  
20 medical instrument in said bimodal representation the X-ray intensity values of the corresponding points in the 2D X-Ray image.
10. A system as claimed in claim 1, comprising means for segmenting a wall tissue region in the 3D ultrasound data set and said generating means are intended to give to  
25 the points belonging to said wall tissue region the ultrasound intensity values of the corresponding points of said region of interest.
11. A system as claimed in claim 1, wherein the X-Ray acquisition means are intended to provide live two-dimensional X-Ray images and the ultrasound acquisition means  
30 live three-dimensional ultrasound data sets.
12. A system as claimed in claim 11, comprising controlling means for periodically triggering the probe localization means.

13. A system as claimed in claim 11, comprising means for compensating a motion between a current three-dimensional ultrasound data set acquired at a current time and a previous three-dimensional ultrasound data set acquired at a previous time.

- 5 14. A method of guiding a medical instrument in a patient body, comprising the steps of:
- acquiring a two-dimensional X-ray image of said medical instrument using an X-ray acquisition system,
  - acquiring a three-dimensional ultrasound data set of said medical instrument using said ultrasound probe and an ultrasound acquisition system,
  - 10 - localizing said ultrasound probe in a referential of said X-ray acquisition system,
  - selecting a region of interest of said medical instrument within said 3D ultrasound data set, that define a first localization of said region of interest within a referential of said ultrasound acquisition system,
  - converting said first localization within said referential of said ultrasound acquisition system into a second X-Ray localization within said referential of the X-ray acquisition system,
  - 15 - generating and displaying a bimodal representation of said medical instrument in which said two-dimensional X-ray image and the three-dimensional ultrasound data included in said region of interest are combined using said second localization.